IOWA STATE UNIVERSITY
Institute for Transportation

ctre
Center for Transportation Research and Education

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Iowa Pavement Management Program and other CTRE Things

IPMP
Iowa Pavement Management Program

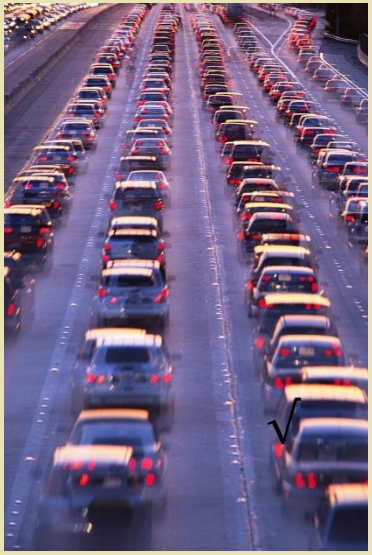
Inya Nlenanya

Spring 2015 Technical Analysis Peer Exchange (TAPE)

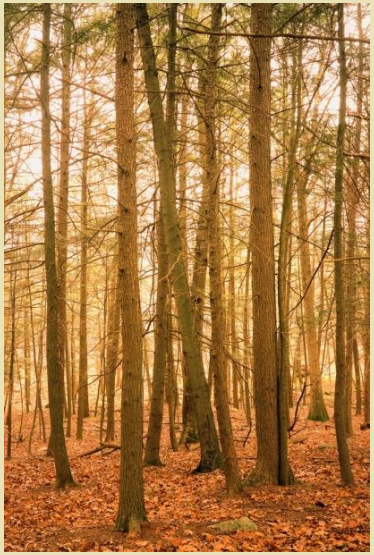
May 28, 2015

National Performance Areas

Infrastructure Condition



Congestion Reduction & System Reliability



Environmental Sustainability

Freight Movement & Economic Vitality

Safety

Reduced Project Delivery Delays

National Performance Areas

Infrastructure Condition

Safety

National Performance Areas

Metropolitan planning organizations (MPOs) will be required to establish and use a performance-based approach to transportation decision making and development of transportation plans.

MAP-21 TAMP Requirements

- TAM Objectives
- Asset Inventory/Condition
- Performance Gap
- Life Cycle cost
- Financial Plan
- Investment Strategies
- Risk Management

National Performance Areas

Infrastructure Condition

Why do we do PMS?

Limited resources

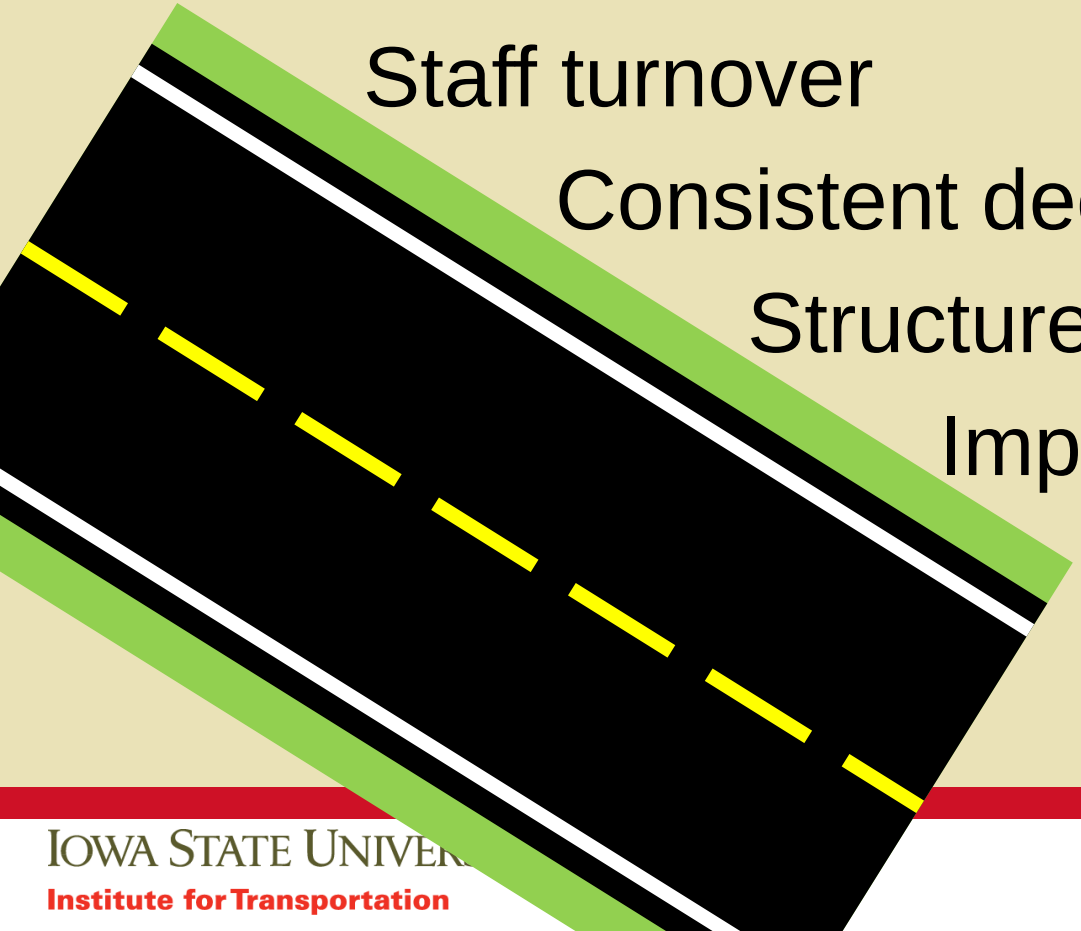
Staff turnover

Consistent decisions

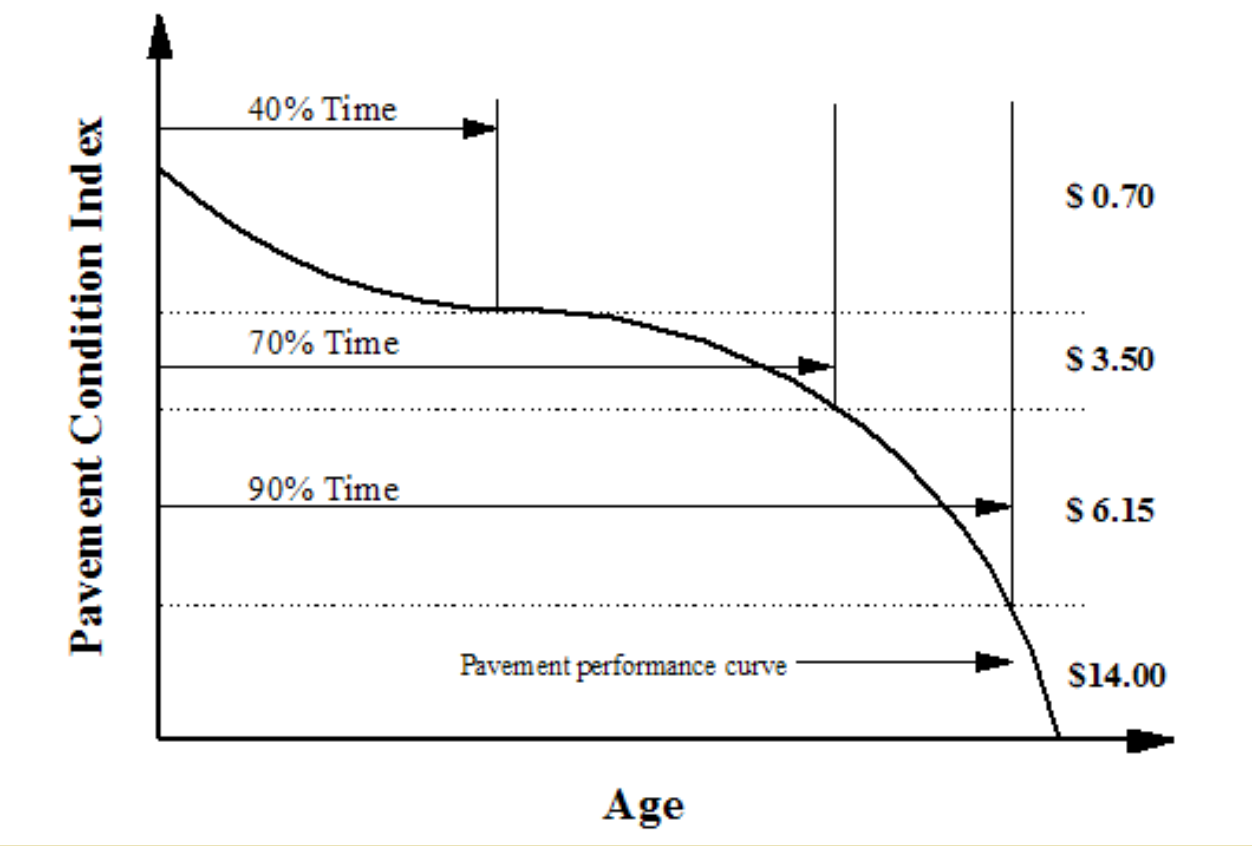
Structured/Objective process

Improved condition

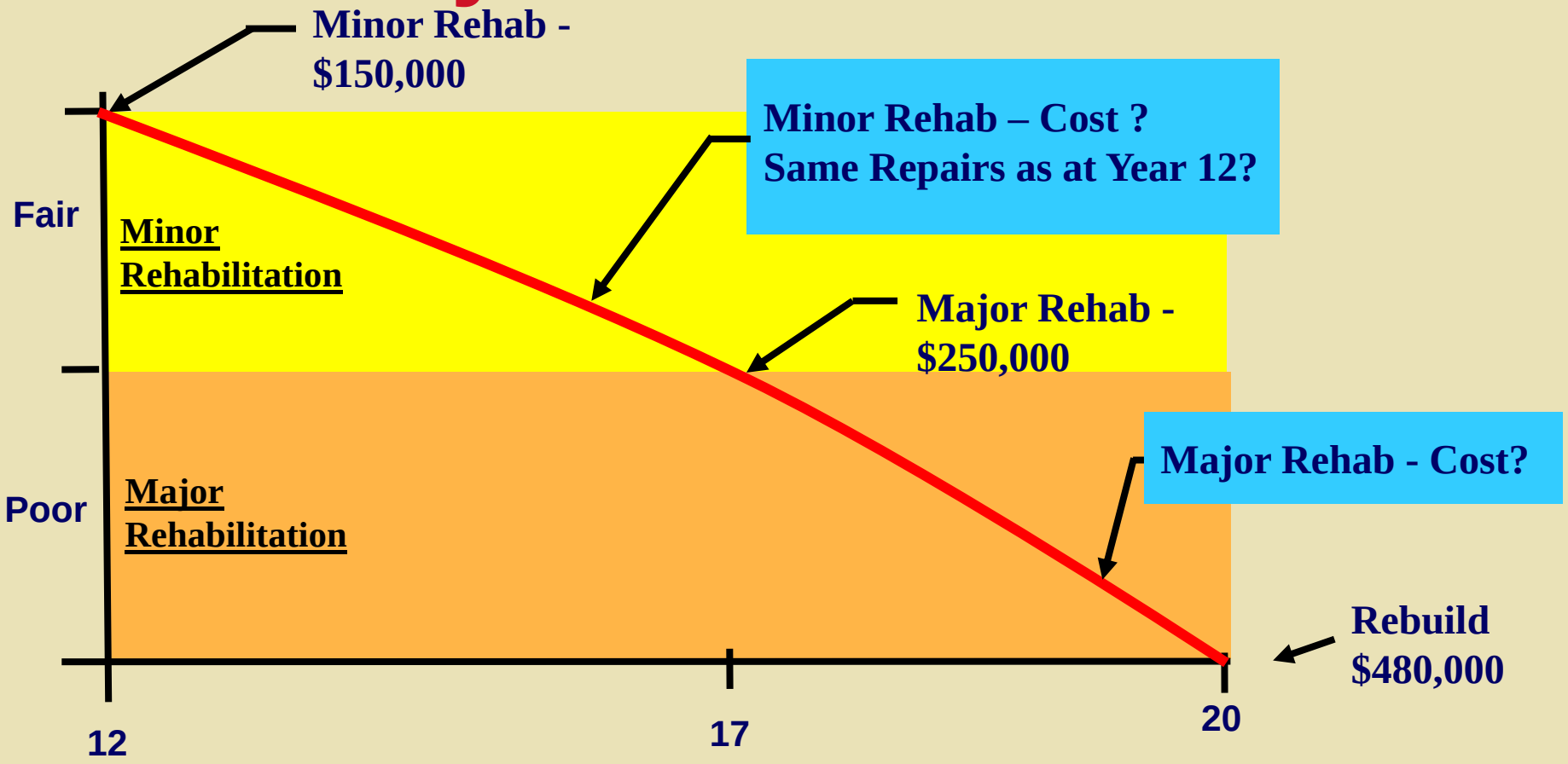
MAP-21



Why do we do PMS?



Why do we do PMS?



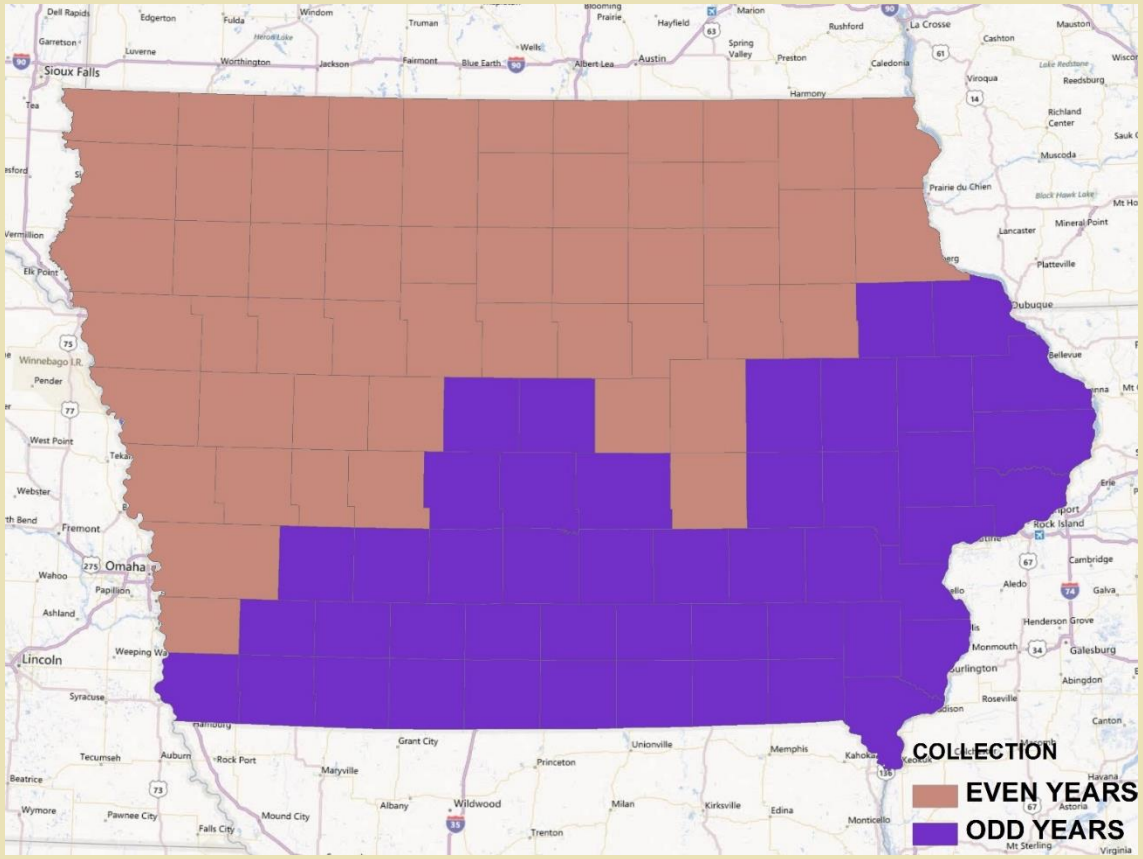
PMS Components

- Condition Data
- Database (Data Integration-GIS/GPS)
- Performance Forecasting
- Decision Support Tools

The goal of pavement management is to apply the right treatment, to the right pavement, at the right time

- Can’t fix a problem you don’t know you have
- Need to know the symptoms to determine a treatment

Data collection

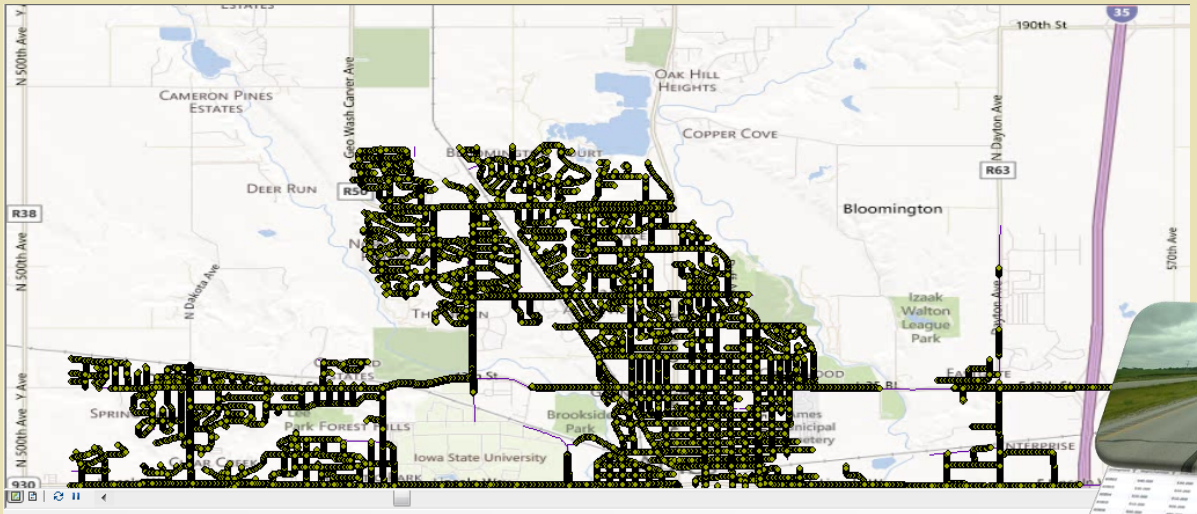


Contacting local agencies

- Half the state is collected every year
- Information is sent out via the DOT to local agencies in the regions to be collected
- Additional services such as ROW video log and pavement management software

Deliverables

Raw Distress Data



Table

ames_join_v2

OBJECTID_1 *	Shape *	OBJECTID	ROUTING_NO	RUN_NO	ROAD_ID	ROAD_NAME	LANE	DIR	BEGIN_MILE	END_MILE	BEGIN_GLAT	BEGIN_GLO	
6360	Point	4150	404840	1	U	SPRINGBROOK DR	1	5	0.11	0.12	42.026556	-93.690	
6351	Point	4148	404840	1	U	SPRINGBROOK DR	1	5	0.09	0.1	42.02645	-93.691	
6349	Point	4146	404840	1	U	SPRINGBROOK DR	1	5	0.07	0.08	42.026372	-93.69	
6348	Point	4145	404840	1	U	SPRINGBROOK DR	1	5	0.06	0.07	42.026333	-93.6	
6342	Point	4139	404840	1	U	SPRINGBROOK DR	1	5	0	0.01	42.026102	-93	
6347	Point	4144	404840	1	U	SPRINGBROOK DR	1	5	0.05	0.06	42.026293	-9	
6346	Point	4143	404840	1	U	SPRINGBROOK DR	1	5	0.04	0.05	42.026254	-9	
6345	Point	4142	404840	1	U	SPRINGBROOK DR	1	5	0.03	0.04	42.026216	-9	
6350	Point	4147	404840	1	U	SPRINGBROOK DR	1	5	0.08	0.09	42.02641	-9	
6343	Point	4140	404840	1	U	SPRINGBROOK DR	1	5	0.01	0.02	42.026141	-9	
6361	Point	4151	404840	1	U	SPRINGBROOK DR	1	5	0.12	0.13	42.026622	-93.690686	42.02
6362	Point	4152	404840	1	U	SPRINGBROOK DR	1	5	0.13	0.14	42.026696	-93.690519	42.02
6363	Point	4153	404840	1	U	SPRINGBROOK DR	1	5	0.14	0.15	42.026779	-93.690358	42.02
6364	Point	4154	404840	1	U	SPRINGBROOK DR	1	5	0.15	0.16	42.026869	-93.690205	42.02
6365	Point	4155	404840	1	U	SPRINGBROOK DR	1	5	0.16	0.17	42.026965	-93.690059	42.02

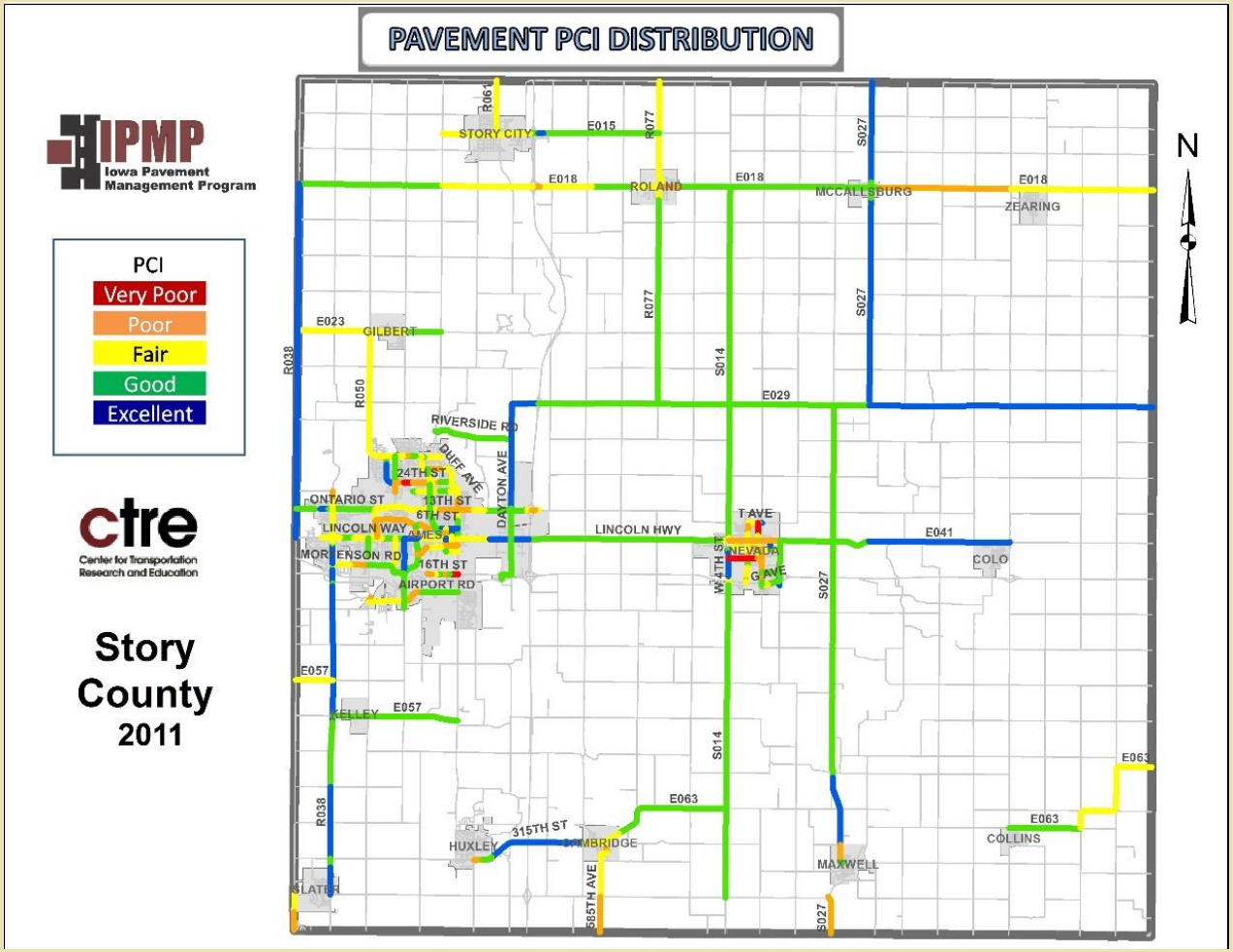
Raw Distress Data

100% coverage

- Roughness (IRI) – left, right
- Rutting – left, right
- **Alligator cracking – LMH**
- **Transverse cracking – LMH**
- **Longitudinal cracking – LMH**
- **Longitudinal wheelpath cracking - LMH**
- Patch – good, bad
- Patch count
- **Durability cracking - MH**
- **Joint spalling – MH**
- Faulting – left, right - 1234

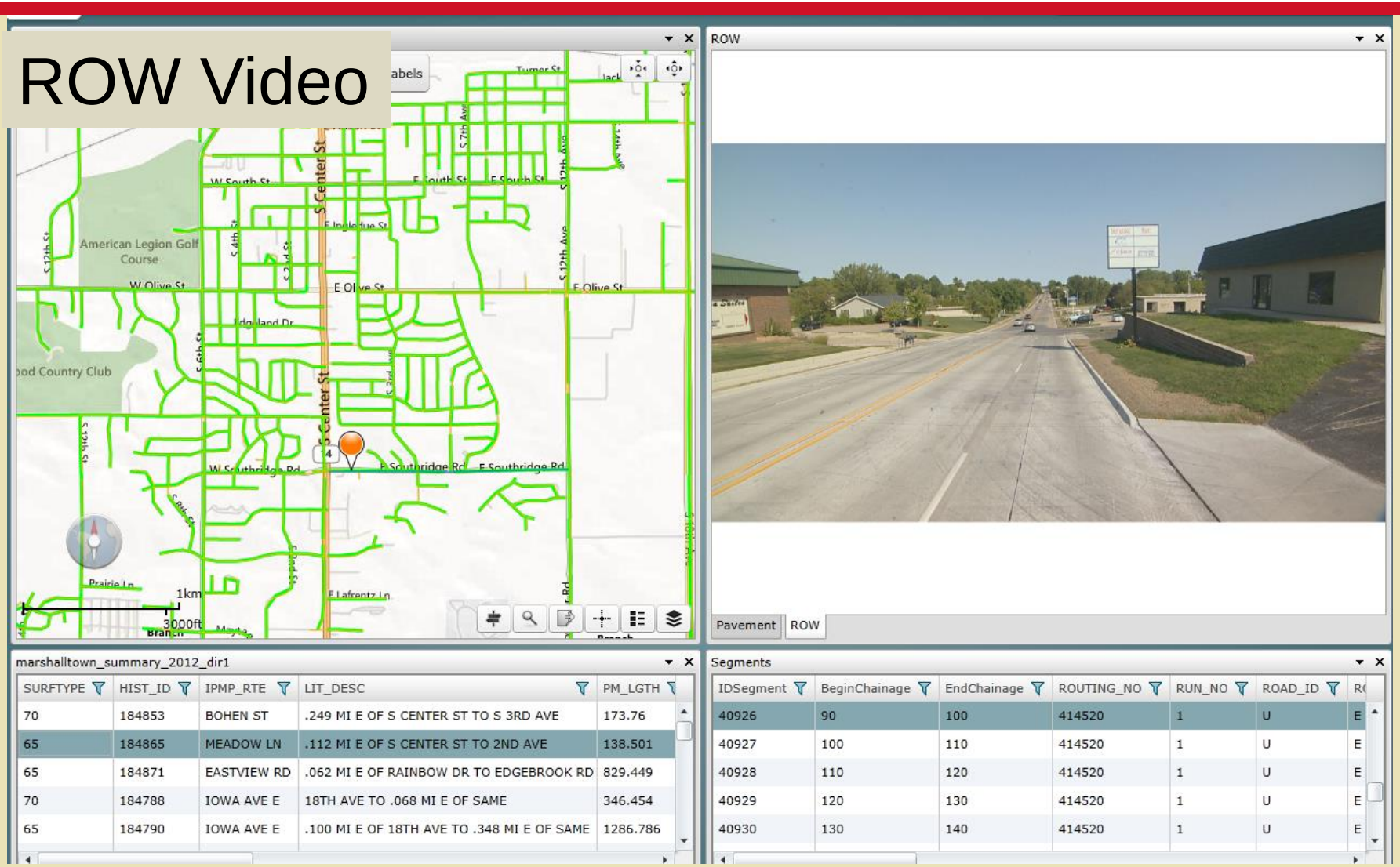
Deliverables

Pavement condition data



Deliverables

ROW Video



marshalltown_summary_2012_dir1

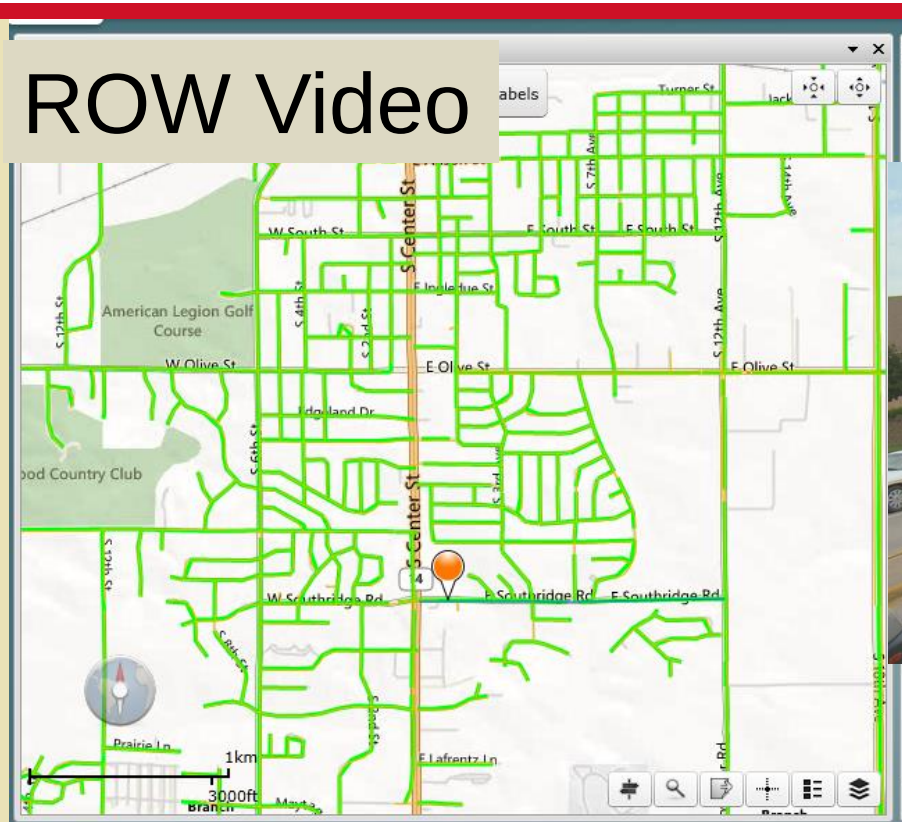
SURFTYPE	HIST_ID	IPMP_RTE	LIT_DESC	PM_LGTH
70	184853	BOHEN ST	.249 MI E OF S CENTER ST TO S 3RD AVE	173.76
65	184865	MEADOW LN	.112 MI E OF S CENTER ST TO 2ND AVE	138.501
65	184871	EASTVIEW RD	.062 MI E OF RAINBOW DR TO EDGEBROOK RD	829.449
70	184788	IOWA AVE E	18TH AVE TO .068 MI E OF SAME	346.454
65	184790	IOWA AVE E	.100 MI E OF 18TH AVE TO .348 MI E OF SAME	1286.786

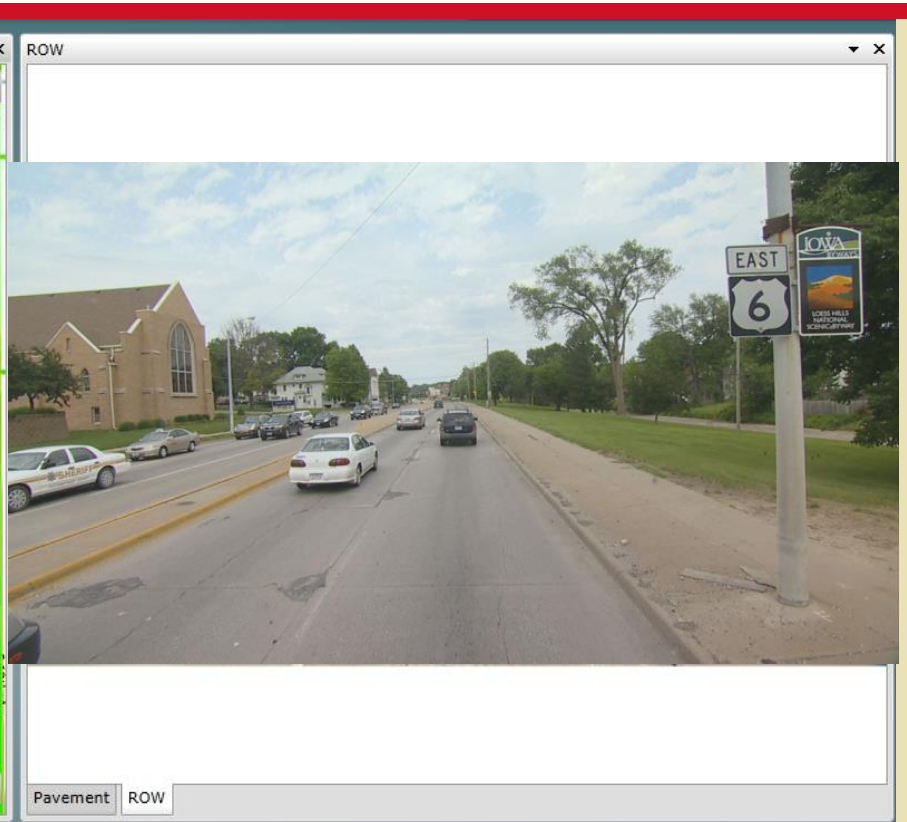
Segments

IDSegment	BeginChainage	EndChainage	ROUTING_NO	RUN_NO	ROAD_ID	R
40926	90	100	414520	1	U	E
40927	100	110	414520	1	U	E
40928	110	120	414520	1	U	E
40929	120	130	414520	1	U	E
40930	130	140	414520	1	U	E

Deliverables

ROW Video





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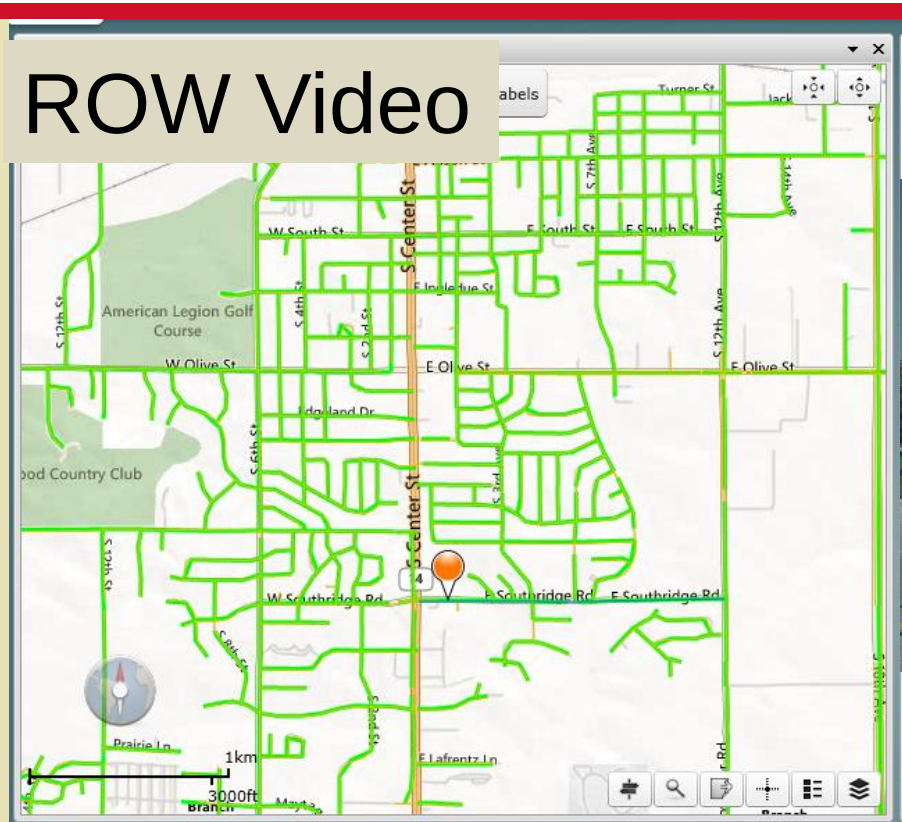
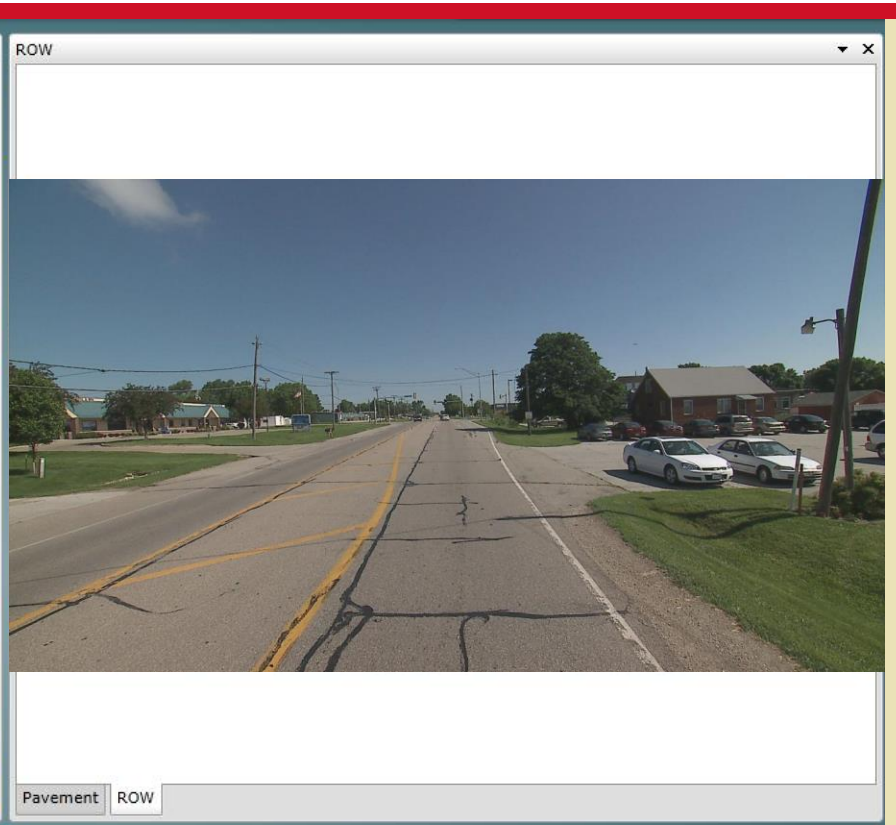
Deliverables

ROW Video





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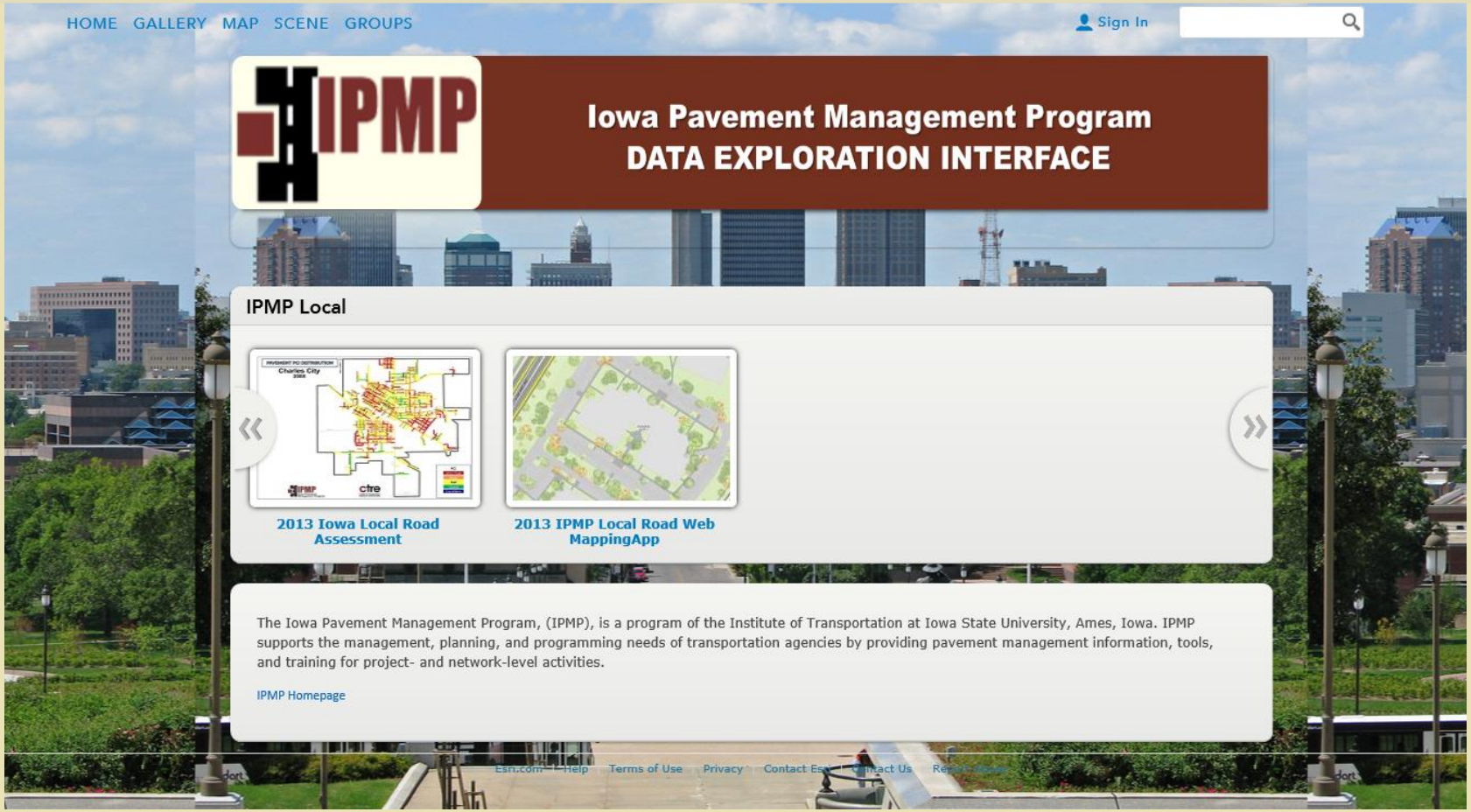
40929	120	130	414520	1	U	E
40930	130	140	414520	1	U	E

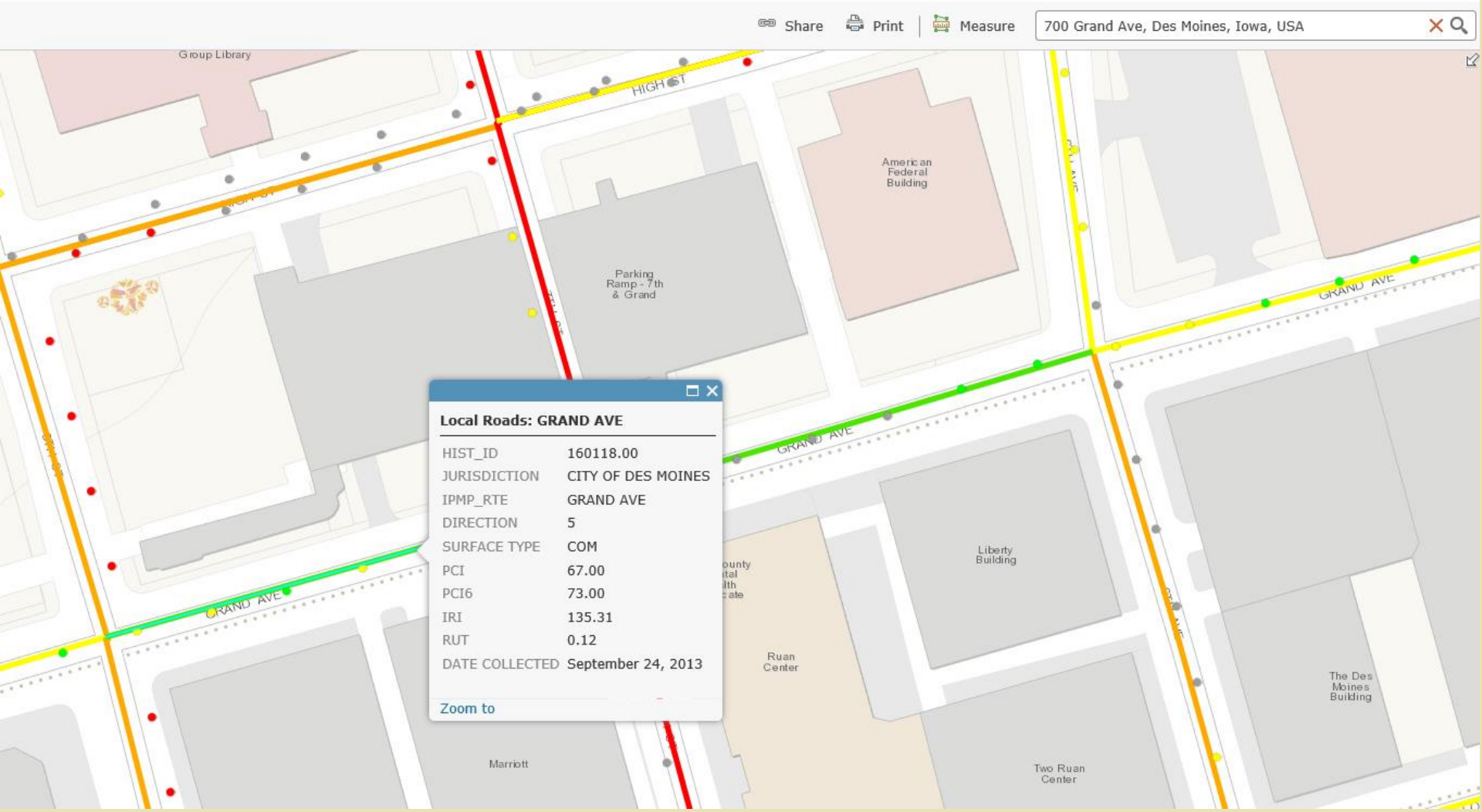
Web delivery

- **Beginning 2013, distress data is collected on all public, paved roads.**

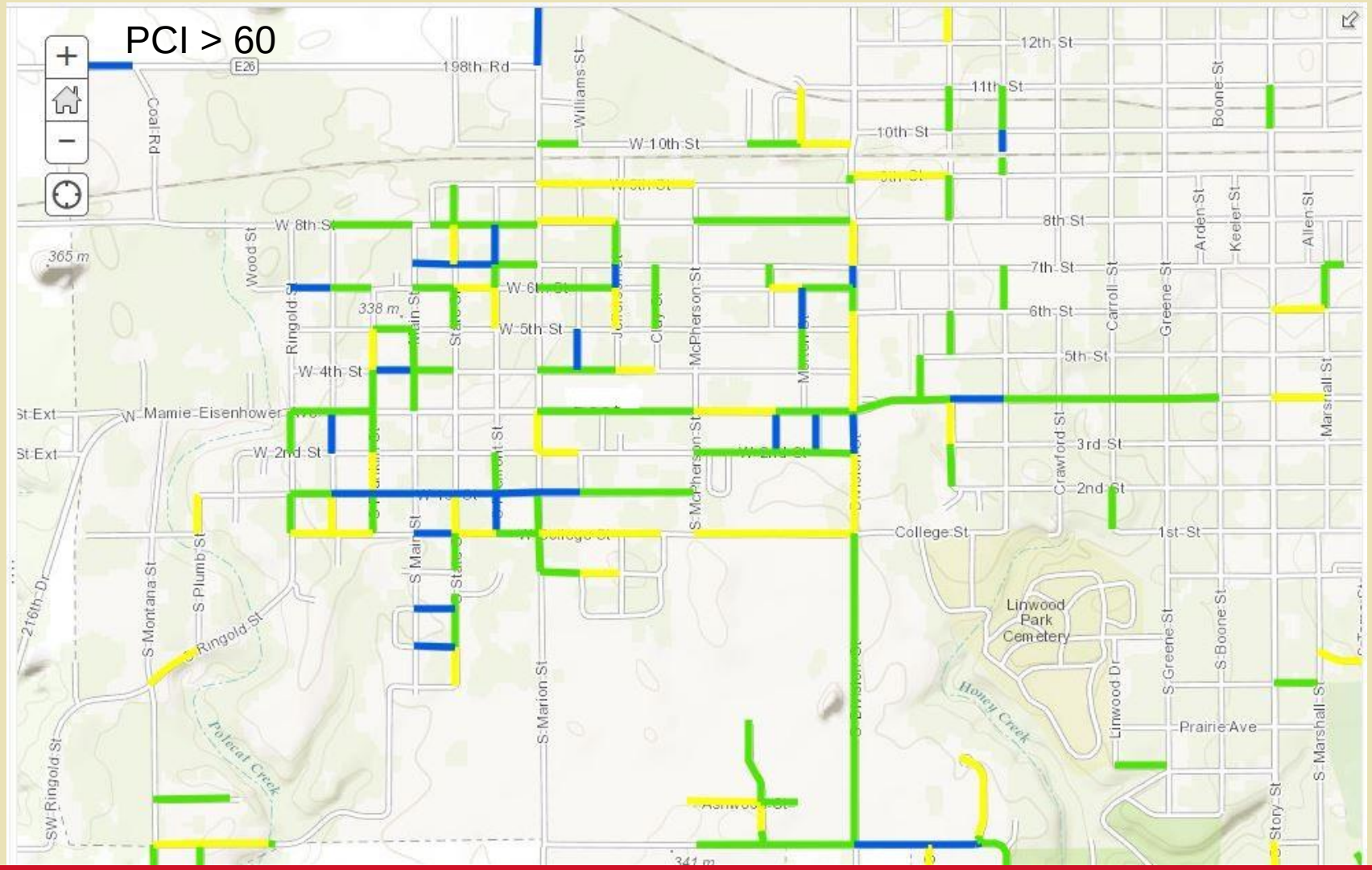


Web delivery

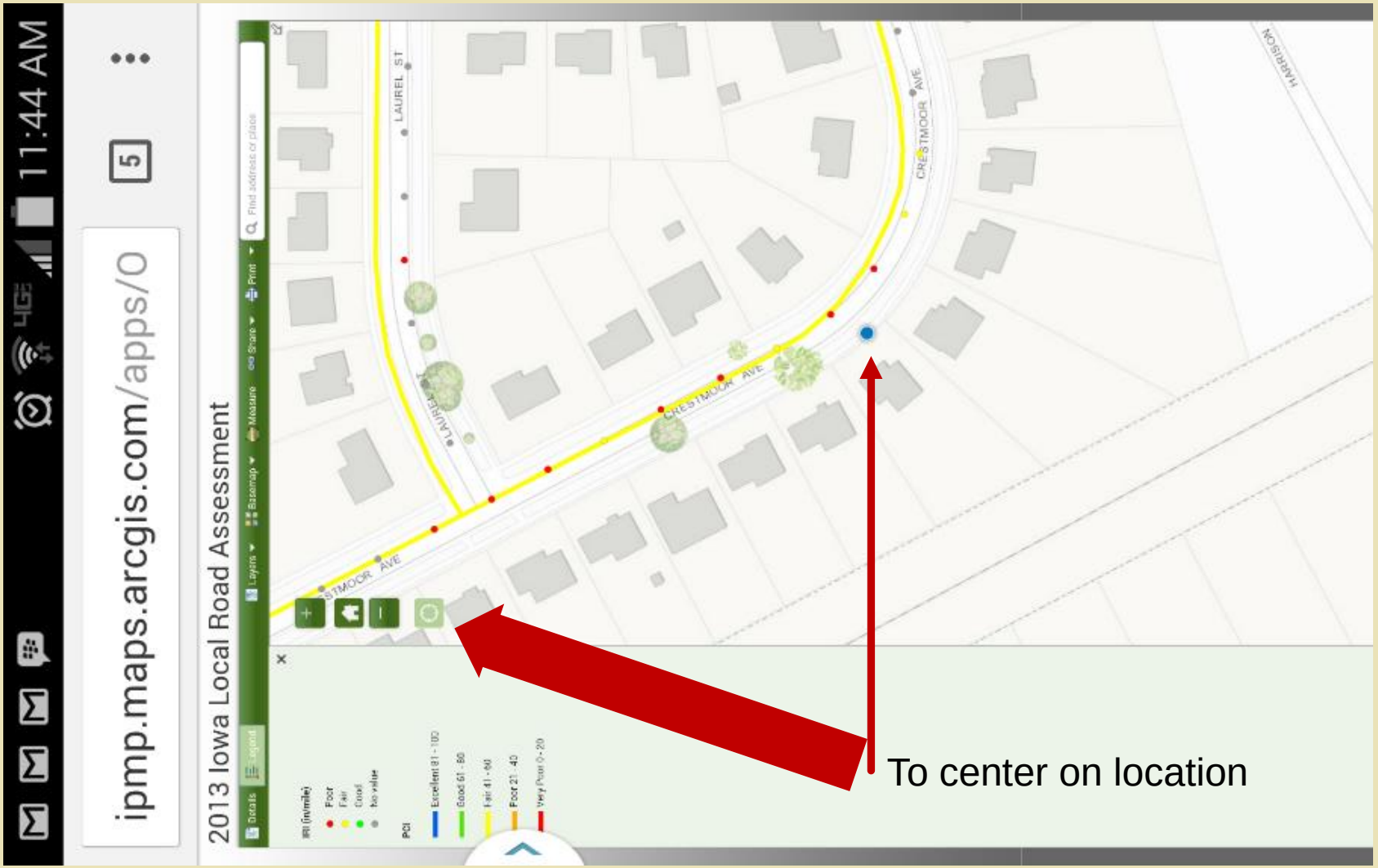
Project level



Network level



Ground level- mobile access



PMS SOFTWARE

- dTIMS:
  - Multi-year Prioritization
  - Incremental Benefit Cost Analysis
  - Deterministic Performance Forecasting
  - Project Selection
  - Budget Analysis

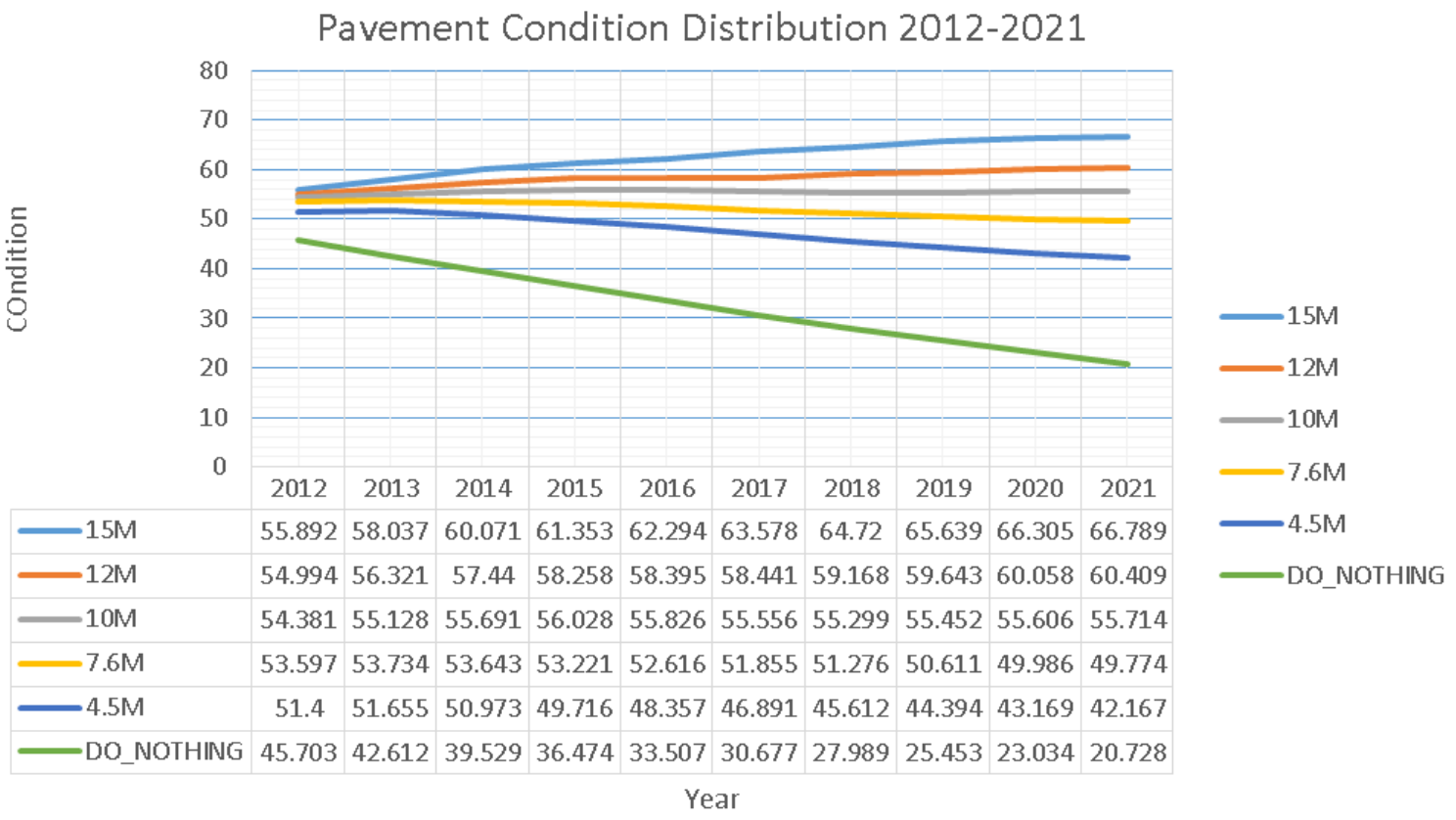
dTIMS

- Implementation:
  - Data
  - Performance curves
  - Treatment strategies
  - Trigger limits
  - Improvements
  - Evaluation

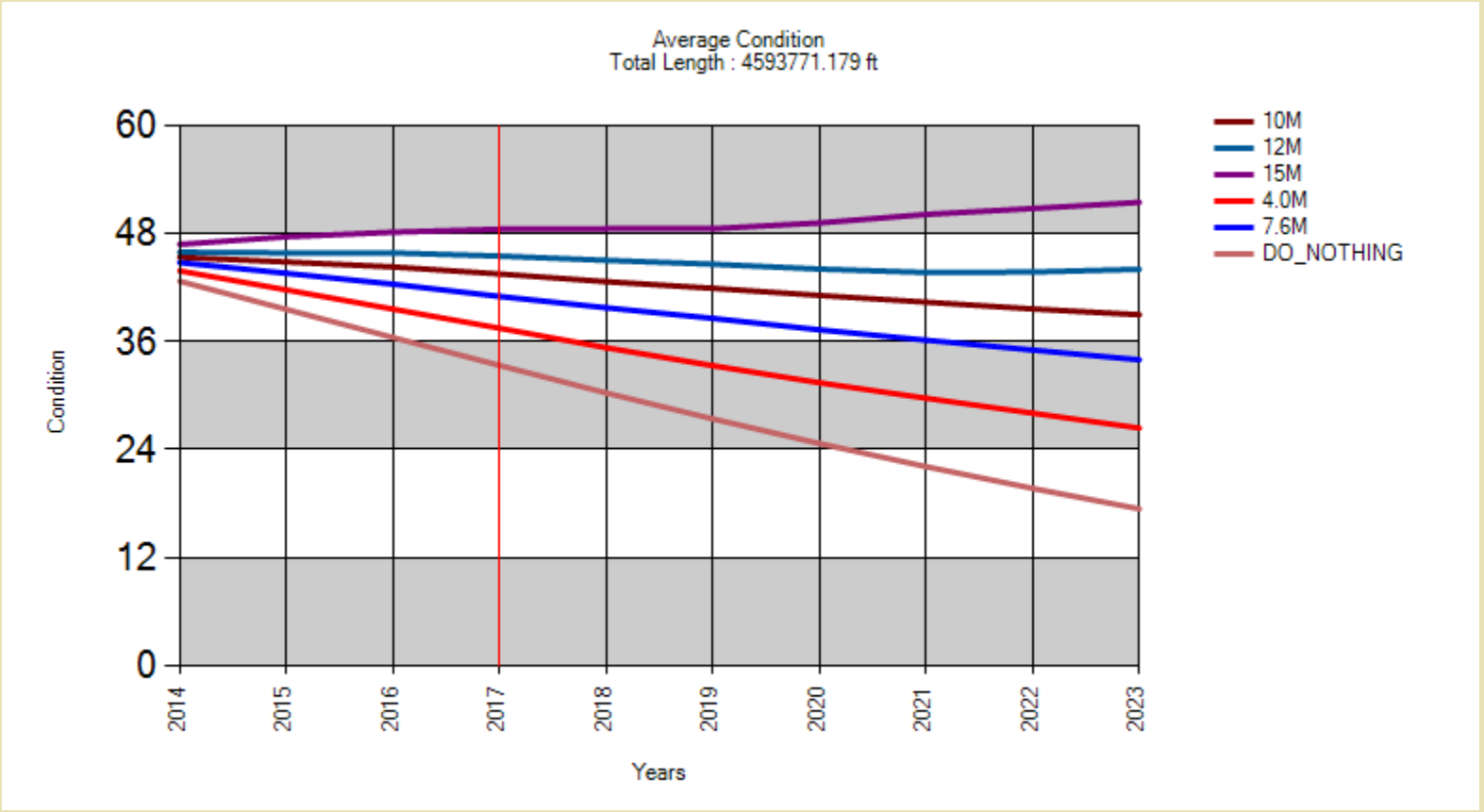
dTIMS

- Results:
  - Recommended Projects (by year)
  - Recommended Treatments (project & year)
  - Overall Analysis Summaries:
    - Condition
    - Backlog
    - Treatment cost
    - Treatment length

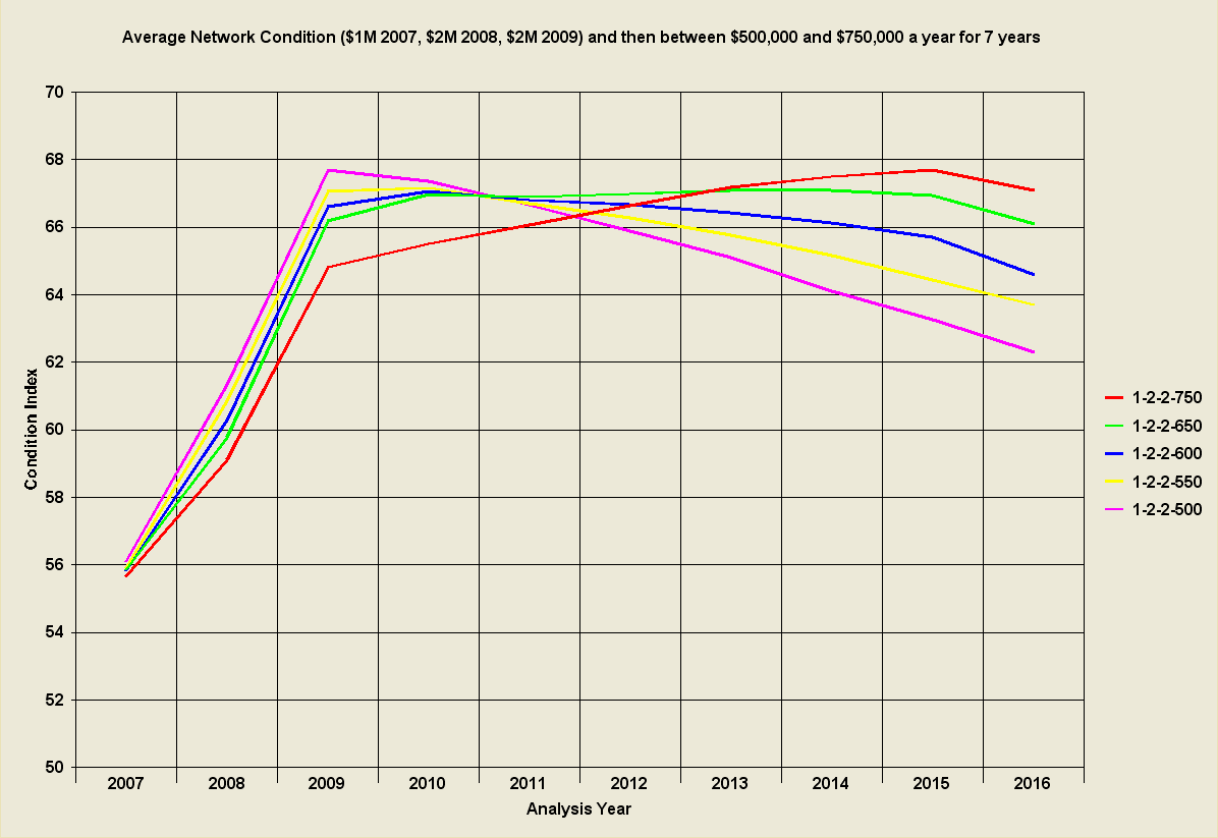
PMS Software



PMS Software

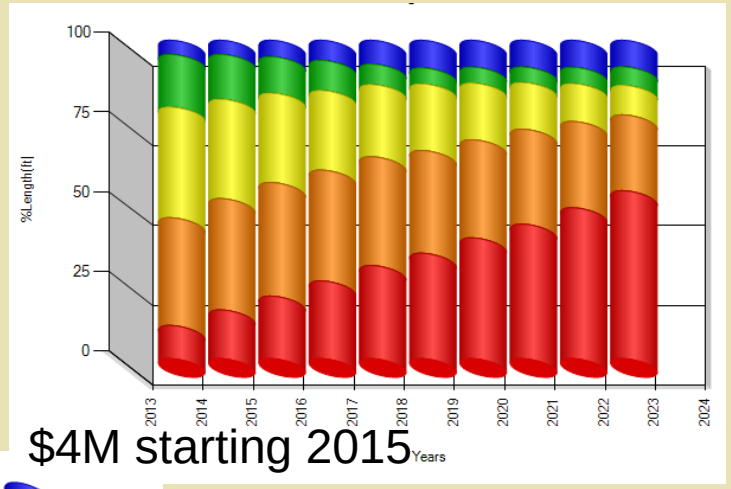


PCI Trends for Future $

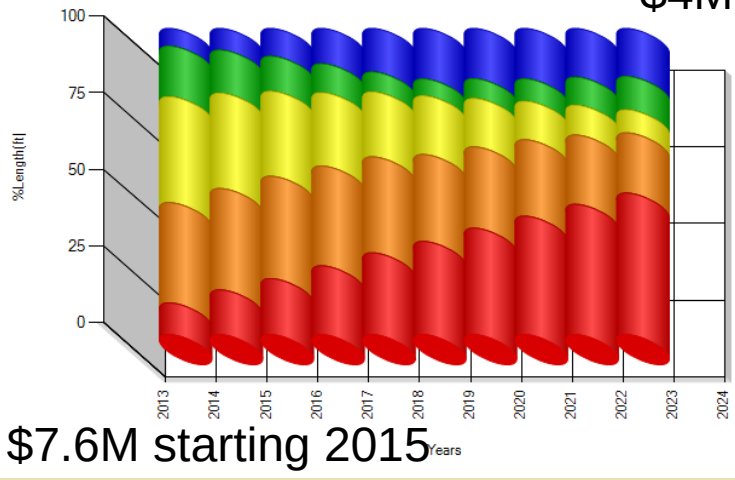


Condition Distribution by % Feet

DO NOTHING



$4M starting 2015



$7.6M starting 2015

Example Results

Elements

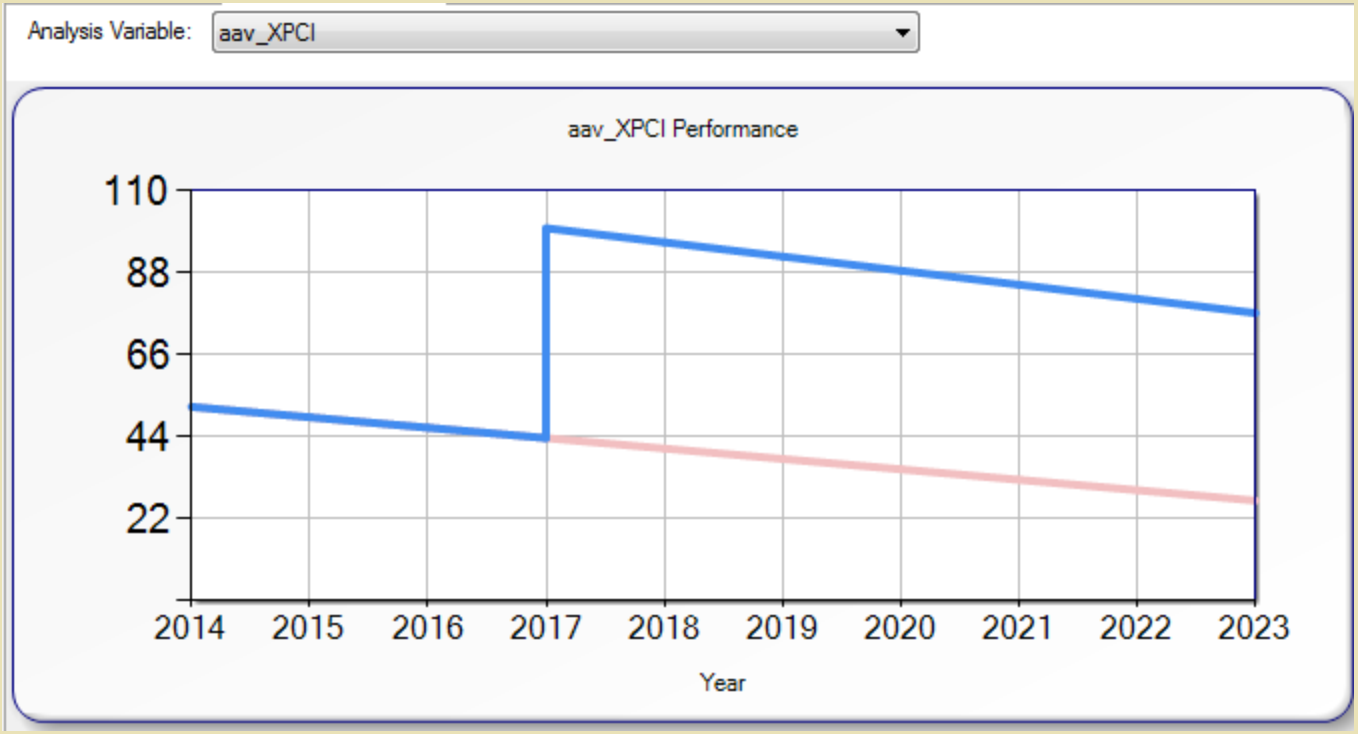
onize

	IPMP_RTE	LANES	PAVE_TYPE	PCI_CUR	LIRI	LOC_ROUTE	LONG_H	LONG_L	LONG_I
13	E SOUTHLA	2	P	49.00	264.78		0.00	19.40	20.59
14	SE 31ST ST	0	P	43.00	233.80		0.00	27.76	0.00
15	SE 31ST ST	0	P	53.00	398.56		0.00	42.87	18.24
16	E SOUTHLA	2	P	65.00	264.02		0.00	2.36	0.00
17	CO LINE RD	2	P	69.00	206.57		0.00	12.49	0.00
18	HICKMAN RD	4	P	52.00	152.92	HICKMAN RD	8.22	1108.36	108.64
19	HICKMAN RD	4	P	55.00	126.67	HICKMAN RD	3.56	844.57	35.89

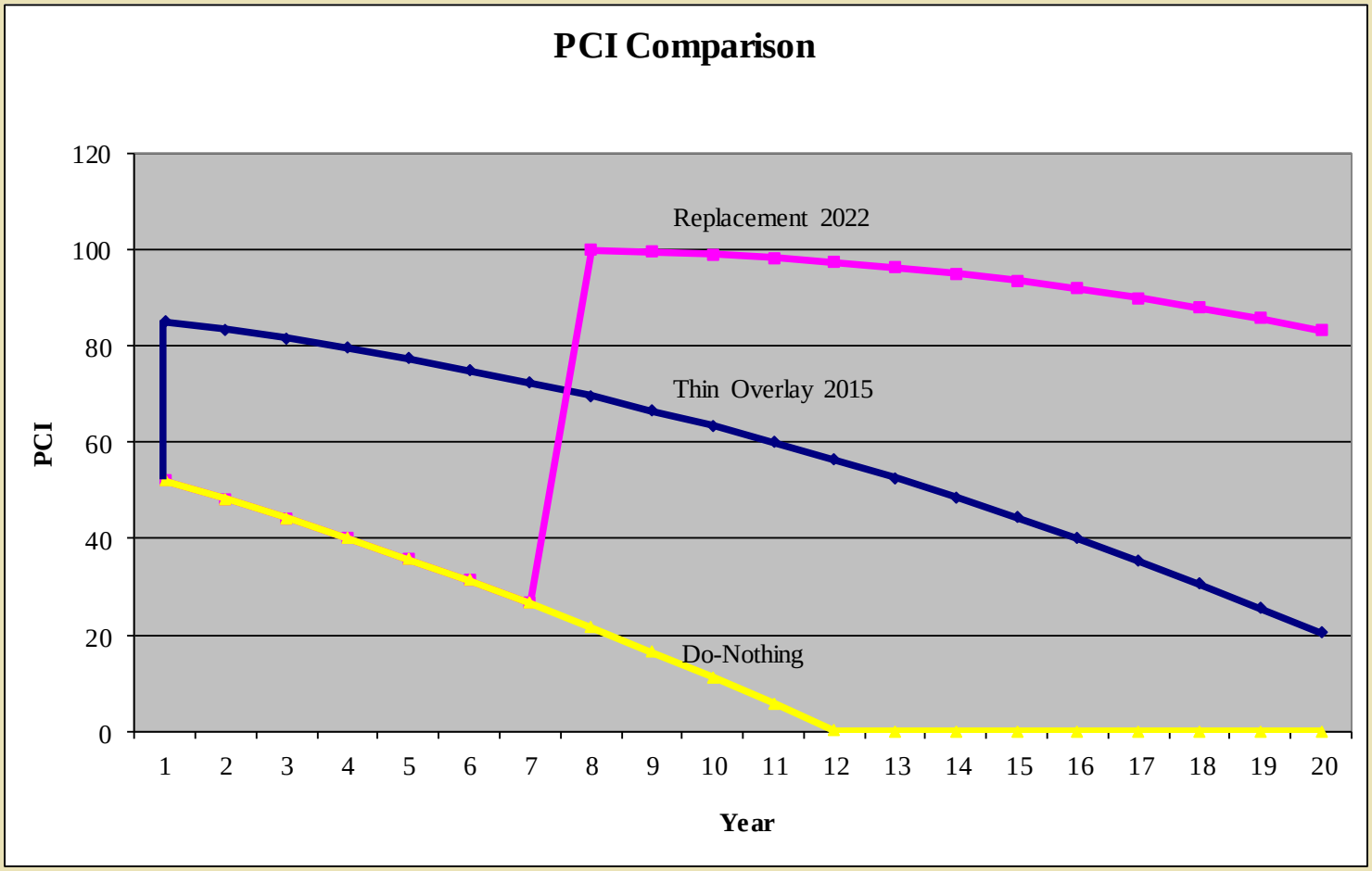
Strategies for Element ID: 1001_5

IBC	Minimum C	Committed	Base Com	Selected	Do Nothing	Savings	Suggested	Year	1st Major
1603.0594	False	False	False	True	False	0	False	2017	OL_2
1597.1293	False	False	False	False	False	0	False	2018	OL_2
1597.8883	False	False	False	False	False	0	False	2016	OL_2
1580.6370	False	False	False	False	False	0	False	2019	OL_2
1581.0606	False	False	False	False	False	0	False	2015	OL_2
1554.0934	False	False	False	False	False	0	False	2020	OL_2
1551.9906	False	False	False	False	False	0	False	2014	OL_2
1517.9944	False	False	False	False	False	0	False	2021	OL_2
1472.8095	False	False	False	False	False	0	False	2022	OL_2
1418.9948	False	False	False	False	False	0	False	2023	OL_2
0	True	False	False	False	False	0	False		

Example Results



Example Results



Other Resources

- Training workshops
- Users' forum

Pavement Marking Management

Data and Tools

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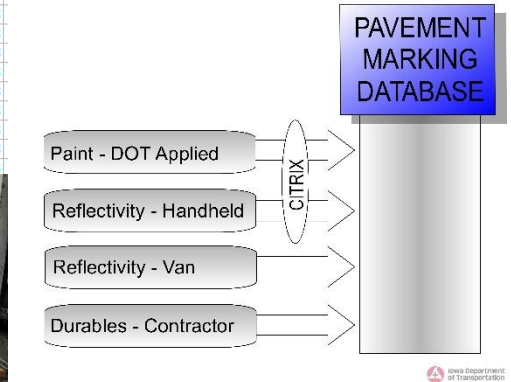
Iowa State University

PAVEMENT MARKING

Painted in 2003 measured in 2004

Route	From MP	To MP	Line Type	2003 Date Painted	2003 Initial LL	2003 Date	2003 LL	2004 Date Painted	2004 Initial LL	2004 Date	2004 LL
0001	85.13	89.44	wdc1	17-Jun-2003	0						
0001	89.44	85.13	wdc1	17-Jun-2003							
0001	90.1	107.39	wdc1	7-Aug-2003							
0001	54	83	wel	7-Oct-2003							
0001	55	68.7	wel	6-Oct-2003							
0001	89.42	98.53	wel	16-Oct-2003							
0001	98.53	107.39	wel	16-Oct-2003							
0001	98.53	89.42	wel	16-Oct-2003							
0001	119.25	108.66	wel	15-Oct-2003							
0001	89.44	87	ycl	17-Jun-2003							
0001	108.66	119.25	ycl	9-Jul-2003							
000											193
000											199.00
000						Sep-2003	182	11-Aug-2004	280		
000						Sep-2003	210	13-Jul-2004	277		
000						Sep-2003	201	12-Jul-2004	266		



INVENTORY

- AADT
- Miles
- Rural/Urban

PAVEMENT

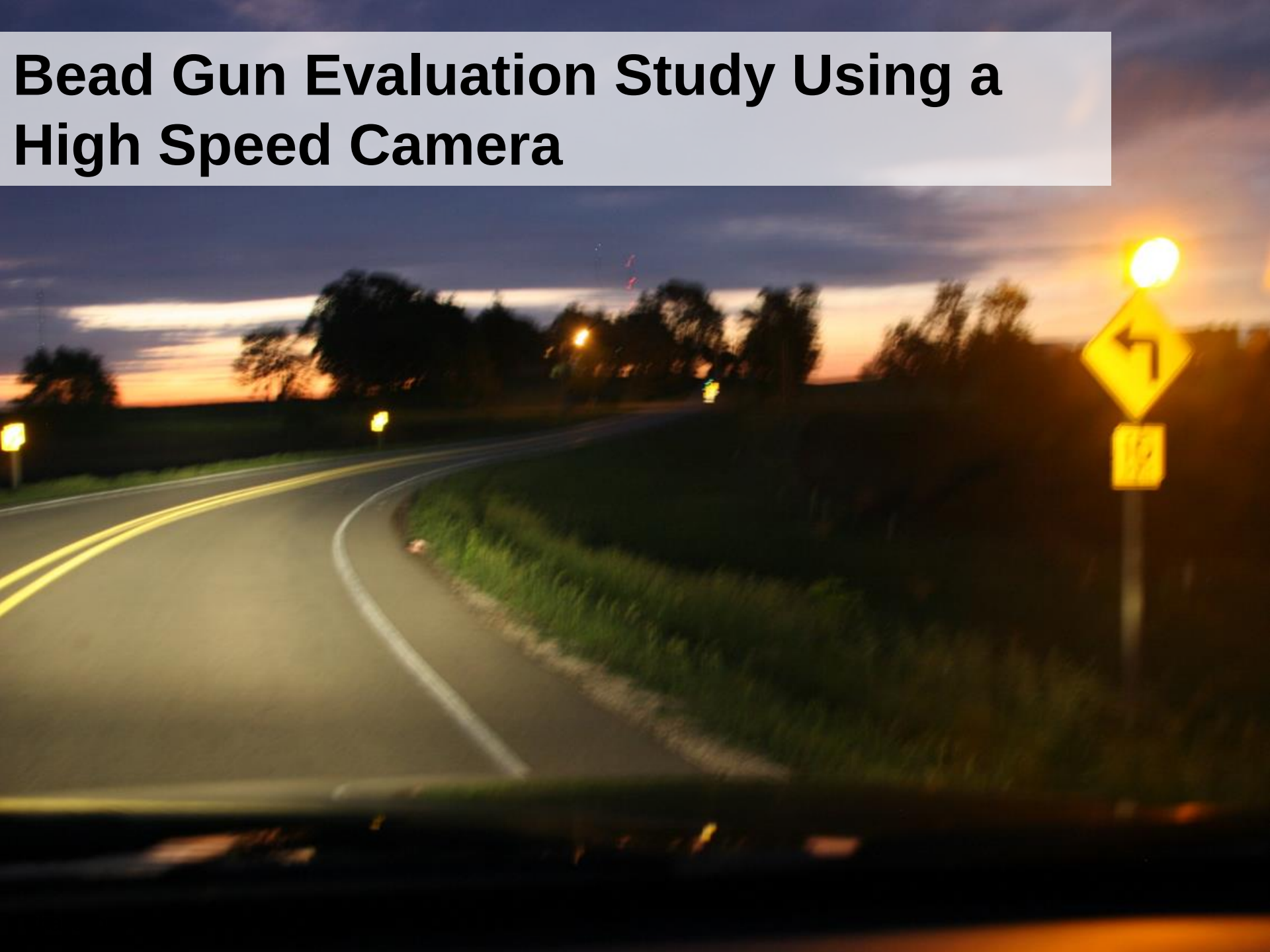
- Condition
- Age
- Pvmt Type

SAFETY

- Location
- Frequency
- Type

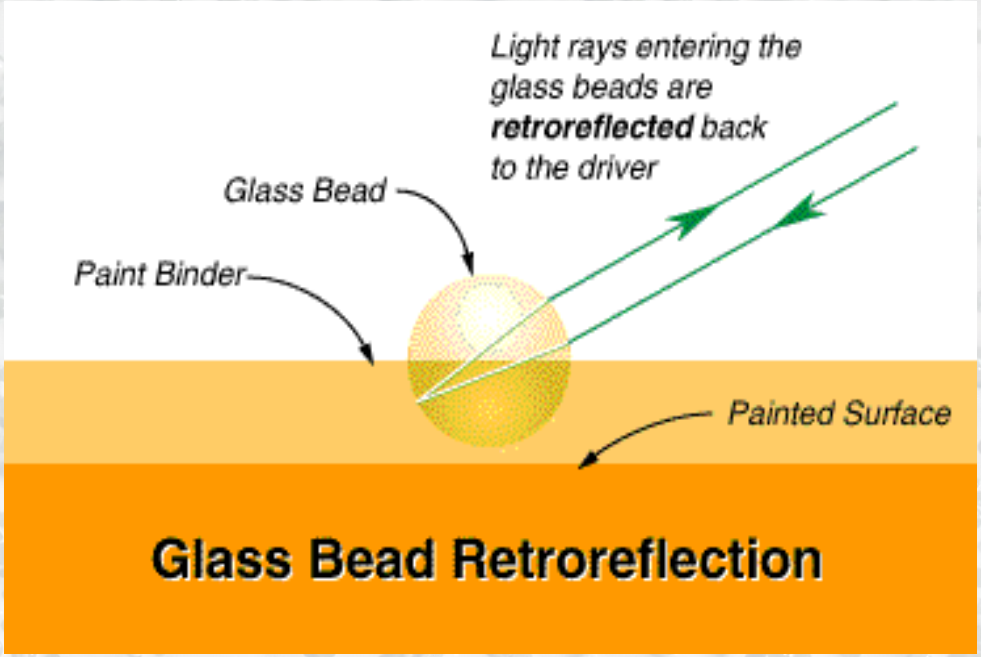
- **Managed on the same segments/coordinates**
- **Marking needs by segment or on a statewide level**
- **Match with 5-year Construction Program**
- **Application Matrix**
- **Input and use by each district**
- **Striping Plan, Costs…**

Bead Gun Evaluation Study Using a High Speed Camera



What do we evaluate?

- Retroreflectivity – night time
  - Number of beads
  - Paint thickness
  - Bead embedment
  - Bead roll



SIGN MANGEMENT
A Discussion on Inventory

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RIMOS
roadway infrastructure management & operations systems

Motivation

Safety

-All Users

-Guidance

-Driver Expectation

FHWA

-National Standard

Minimum Maintained Retro with
Assessment or Management Methods

Methods

MUTCD Assessment or Management Methods

- ✓Visual Assessment
- ✓Measured Retroreflectivity
- ✓Expected Sign Life
- ✓Blanket Replacement
- ✓Control Signs
- ✓Future Methods
- ✓Combination of Methods

Methods

MUTCD Assessment or Management Methods

- ✓ Visual Assessment
- ✓ Measured Retroreflectivity
- ✓ Expected Sign Life
- ✓ Blanket Replacement
- ✓ Control Signs
- ✓ Future Methods
- ✓ Combination of Methods

- **Inventory**
  - Location
  - Attributes
  - Condition
  - Collection
  - Updates
  - Equipment
  - Cost/Training

National Performance Areas

Safety

Iowa Traffic Safety Data Service

providing crash data, analysis and support

IOWA STATE UNIVERSITY
Institute for Transportation

Overview

- **FREE** quick-response service
- Funded by GTSB & Iowa DOT
- Supported by CTRE staff & students
- **120+** requests annually from
  ~**50** different public & private entities

Objectives

- Provide easy-to-understand analyses and reports.
- Assist in obtaining, mapping & evaluating crash data.
- Facilitate
  - decision-making
  - effective presentation of information
  - education
- Support safety's 4Es – engineering, education, emergency response & enforcement.

Web Site

- Current & completed projects
- Request form
- Additional resources

www.ctre.iastate.edu/itsds

MiniCym

- Collaboration between UI and ISU
- K-12 Outreach
  - Safety
  - STEM Career
- Research
  - Human factors
  - Roadway geometry
  - Signal timing

MiniCym

Roadway Research & Design
MOBILE DRIVING SIMULATOR
IOWA STATE UNIVERSITY
Institute for Transportation
ctre
THE UNIVERSITY OF IOWA
THE NATIONAL ADVANCED DRIVING SIMULATOR
IOWA STATE UNIVERSITY
College of Engineering
IOWA STATE UNIVERSITY
Department of Civil, Construction and Environmental Engineering

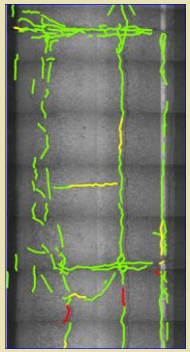
MiniCym

MiniCym

IOWA STATE UNIVERSITY
Institute for Transportation
ctre
Center for Transportation
Research and Education
IOWA STATE UNIVERSITY
College of Engineering
IOWA STATE UNIVERSITY
Department of Civil, Construction
and Environmental Engineering
ANKENY
LOYALTY
ANKENY
TENNIS
RUNNING
THIS
STREET

MiniCym

Questions



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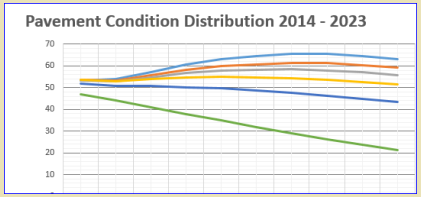

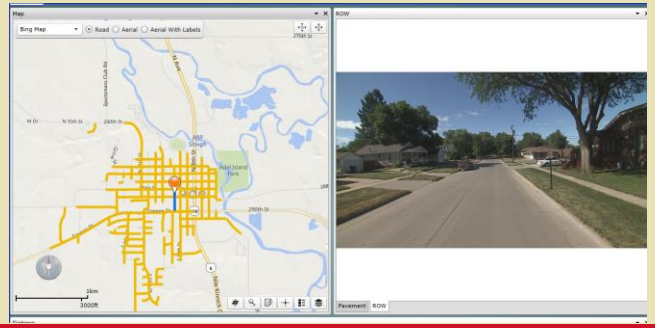

For more information on IPMP visit:
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